

CLAIMS

What is claimed is:

1. A method for forming a hollow composite material part having one or more selectively positioned core, structural insert, or veneer pieces integrally associated therewith, wherein the composite part defines a first shape, and wherein the method comprises at least the following steps:
 - providing a mandrel having an exterior surface and a second shape that is substantially the same as but sized smaller than the first shape of the composite material part, wherein the mandrel has one or more selectively positioned recesses that are complementary to the one or more core, structural insert, or veneer pieces;
 - forming an elastic layer about the mandrel to define an elastic bladder;
 - applying a vacuum in between the bladder and the mandrel to thereby force and conform the bladder against the exterior surface of the mandrel;
 - applying a resin and a fiber material about the bladder, and positioning at least one of the one or more core, structural insert, or veneer pieces adjacent and proximate to one of the one or more selectively positioned recesses to define an uncured part;
 - placing the uncured part into a mold, wherein the mold has an interior surface and a third shape that is substantially the same as the first shape of the composite material part;
 - applying a fluid or gas pressure in between the mandrel and the uncured part to thereby force and conform the uncured part against the interior surface of the mold;
 - heating the mold to a temperature and for a period of time sufficient to cure the resin to thereby define the composite material part;
 - removing the mandrel from within the composite material part; and
 - optionally removing the bladder from within the composite material part.

2. The method of claim 1 wherein the one or more core pieces is made from a honeycomb material.
3. The method of claim 1 wherein the one or more structural insert pieces is made from a metal or a plastic.
- 5 4. The method of claim 1 wherein the one or more veneer pieces is made from a wood.
5. The method of claim 1 wherein the mandrel is made of a wax or a foamed material.
- 10 6. The method of claim 1 wherein the bladder is made from a silicone rubber material.
7. The method of claim 1 wherein the resin is selected from one or more of a polyester resin, a vinyl ester resin, an epoxy resin, and a phenolic resin.
8. The method of claim 1 wherein the fiber material is selected from one or more of a glass fiber material and a carbon fiber material.
- 15 9. The method of claim 1 wherein the mold is an open-ended split mold.
10. The method of claim 1 wherein the applied fluid or gas pressure ranges from about 50 psi to about 150 psi.
- 20 11. The method of claim 1 wherein the temperature of the heated mold ranges from about room temperature to about 400°F.

12. The method of claim 1 wherein the period of time sufficient to cure the resin ranges from about 30 minutes to about 4 hours.

13. The method of claim 1, further comprising the step of applying a second vacuum in between the uncured part and the interior surface of the mold.

5 14. A method for forming a hollow composite material part having one or more selectively positioned core, structural insert, or veneer pieces integrally associated therewith, wherein the composite part defines a first shape, and wherein the method comprises at least the following steps:

providing a first mandrel having an exterior surface and a second shape that
10 is substantially the same as but sized smaller than the first shape of the composite material part, wherein the first mandrel has one or more selectively positioned recesses that are complementary to the one or more core, structural insert, or veneer pieces;

providing a second mandrel having an exterior surface and a third shape that
is substantially the same as but sized smaller than the second shape of the first mandrel,
15 wherein the second mandrel has one or more selectively positioned recesses that are complementary to the one or more core, structural insert, or veneer pieces;

forming an elastic layer about the second mandrel to define an elastic bladder;

removing the bladder from about the second mandrel and placing the
20 bladder about the first mandrel;

applying a resin and a fiber material about the bladder, and positioning at least one of the one or more core, structural insert, or veneer pieces adjacent and proximate to one of the one or more selectively positioned recesses to define an uncured part;

placing the uncured part into a mold, wherein the mold has an interior
25 surface and a fourth shape that is substantially the same as the first shape of the composite material part;

applying a gas or fluid pressure in between the mandrel and the uncured part to thereby force and conform the uncured part against the interior surface of the mold;

heating the mold to a temperature and for a period of time sufficient to cure the resin to thereby define the composite material part;

5 removing the mandrel from within the composite material part; and
optionally removing the bladder from within the composite material part.

15. The method of claim 14 wherein the mandrel is made of a wax or a foamed material.

10 16. The method of claim 14 wherein the bladder is made from a silicone rubber material.

17. The method of claim 14 wherein the resin is selected from one or more of a polyester resin, a vinyl ester resin, an epoxy resin, and a phenolic resin.

18. The method of claim 14 wherein the fiber material is selected from one or more of a glass fiber material and a carbon fiber material.

15 19. A hollow composite material part having one or more selectively positioned core, structural insert, or veneer pieces integrally associated therewith made in accordance with claim 1 or 14.